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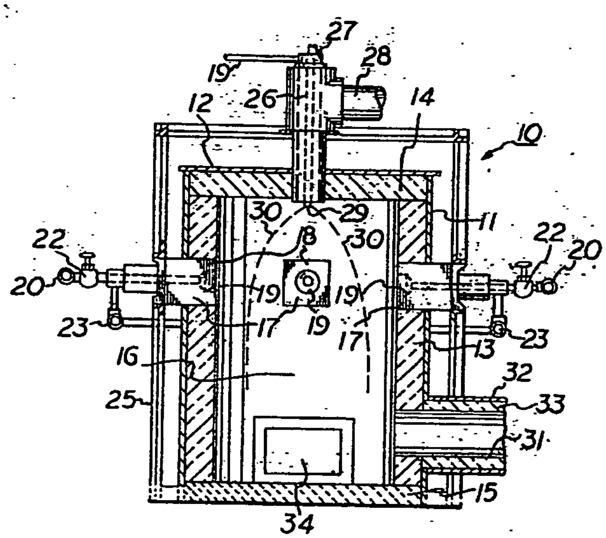
(54) Title: METHOD AND APPARATUS FOR PROCESSING WASTE FLUID

(57) Abstract

Apparatus and methods of processing combustible, partially combustible and non-combustible liquid waste at high temperatures. The invention includes a vertical combustion chamber (16) in which liquids are introduced from the top by means of spray nozzles (29) or similar means. The liquid is treated as it falls by means of a number of flat flame radiation type burners (17) which heat the falling liquid (30) by radiation. During the processing of certain liquids, the falling liquid is totally surrounded by flames, from the top of the combustion chamber to a point where processing is completed and in all cases the liquid is prevented from contacting either the chamber walls (13) or the flames of the burners. Any combustion gases are discharged at the lower end (31) of the combustion chamber and are beneficially utilized. Combustion air is introduced through burners (17) which are used to process certain types of liquid.



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METHOD AND APPARATUS FOR PROCESSING WASTE FLUID

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an apparatus and method for high temperature processing of pumpable liquids.

Background of the Invention

The disposal of waste liquids is an increasing problem for all industries producing waste liquids, as new laws prevent the practice of liquid disposal by land fill. Combustible liquids generated in one location must generally be hauled very long distances to remote areas for incineration. The few large incineration facilities available in the United States are very inefficient by design. Because of their inefficient combustion of waste liquids, they require large and expensive wet scrubbing dust collecting systems to meet current anti-pollution standards. These wet scrubbers produce their own problems by generating an effluent which must be disposed of in some manner. Also, since the incinerators are typically located in remote areas, it is not possible to efficiently convert the generated heat into useful energy.

It is recognized that to process some waste liquids dust collecting devices are required. The present invention provides for dust collecting equipment to be utilized only if liquids are processed that produce exit gases which harm the environment.

Other existing waste liquid incinerators are highly specialized devices generally used in small installations for specific liquid disposal. Technical limitations such as feeding the liquid into the com-

bustion chamber, uneven temperature in the combustion chamber, type of combustion chamber insulation, different combustion characteristics of the liquid to be processed, or sticking of the resulting slag to the combustion chamber walls limit the applicability of prior art incinerators. In addition, liquid incinerators of the prior art are subject to harmful explosions and to frequent damage due to explosions in the combustion chamber.

The objective of the present invention is to provide a waste liquid furnace that can process almost all liquids that can be pumped and totally combust all combustible particles in the liquid. This is accomplished by subjecting the smallest practical particle of the waste to a high temperature and a relatively long retention time. The retention time at a high temperature can be increased if required.

SUMMARY OF THE INVENTION

The method and apparatus of the present invention for processing fluid or liquid refuse utilizes a vertical, insulated combustion chamber having a top and a bottom. Radiant burner means are provided on the side walls of the combustion chamber within the furnace which are capable of heating the combustion chamber with radiant heat to a temperature sufficiently high to process fluid refuse within the chamber. At least one waste fluid spray nozzle is provided in the top of the combustion chamber to spray the liquid refuse downwardly in a predetermined pattern within the combustion chamber. The spray pattern is such that the spray does not contact the side walls of the chamber and does not impinge on the flame of the radiant burner means so as to fully combust the liquid without flame

impingement. Combustion air is continually supplied to the combustion chamber, and the resulting combustion gases are drawn off adjacent to the bottom of the combustion chamber to provide a negative pressure in the chamber. To conserve energy, the hot combustion gases that are directed through a boiler or heat exchanger in order to utilize the high temperature usually in excess of 2,000°F of the exit gases in other processes such as heating the plant facilities.

The invention also provides for the use of ceramic fiber felt for the insulation of the combustion chamber walls rather than the conventional type refractory which has a number of disadvantages.

While any cross-sectional configuration of the combustion chamber may be utilized, a cylindrical combustion chamber is preferred. It is believed that the radiant heat emanating from the side walls will be more uniformly distributed and will more uniformly process the falling liquid spray within the chamber.

The radiant burner means positioned in or on the side walls of the combustion chamber consist preferably of a plurality of flat flame radiant type burners disposed about the inner side walls of the combustion chamber. With some waste liquids, more radiant heat processing time or retention time will be required than for other waste liquids. In such situations, a plurality of flat flame radiant burners are provided along the length of the chamber and disposed about the inner walls to consecutively address the falling liquid. In addition, the side wall burners provide a partial separation of flame or air between the inner side walls and the falling liquid spray pattern to protect the insulation side walls from spray contact.

With radiant type burners, combustion air is supplied to the combustion chamber through the burners themselves. This is also true in situations where combustible liquid refuse being processed has attained sustained combustion and the side wall radiant burner means shut off after the combustion chamber has attained the appropriate heat. In those situations where refuse spray has attained sustained combustion, and the burner fuel is turned off combustion air is still supplied to the combustion chamber through the side wall burners. The number and actual positioning of the burners depend upon the type of liquid and capacity of the furnace.

The liquid to be processed is introduced into the combustion chamber by one or more spray nozzles, and, for maximum efficiency, the liquid is air atomized at a suitable pressure and flow rate. Non-clog nozzles are preferably used to produce a predictable spray pattern at a specific diameter. The liquid spray is positioned centrally of the combustion chamber and corresponds with the desired optimum distance between the burner flame and the liquid. The liquid does not impinge on the burner flame. The number of spray nozzles feeding liquid into the combustion chamber depends on the furnace capacity and types of liquids to be processed. In certain furnaces, the nozzles will feed different types of liquid simultaneously into the same combustion chamber. Thus, one nozzle may feed combustible liquid, another may feed non-combustible liquid, while still another nozzle may feed liquids with a high solid content.

For combustible liquids, the burner means preheats the combustion chamber. During normal processing of combustible liquids, the burners are turned off after

the chamber attains the desired temperature, but the primary air through the burners is maintained to supply primary air for the liquids to be processed and cooling air for the combustion chamber. The burners may be intermittently operated should the temperature for any reason drop below a set level.

For partially combustible liquids, the burner means provides sufficient heat to evaporate moisture and combust the remaining liquid.

For non-combustible liquids, the burner means are arranged to provide optimum radiant heat for the liquid to be processed. The burners may be arranged to form an almost uninterrupted wall of flame from the top of the combustion chamber to a point at which no more processing is required. Under these conditions, the burner flames also serve as a separation media between the processed liquid and the combustion chamber insulation.

During processing of hazardous liquids, the burner quantity and arrangement may be the same as for non-combustible liquids.

In certain furnaces of the present invention, the flat flame burners may be used to supply waste liquid in place of fuel. Thus, during the processing of combustible liquids, it may be advantageous to start the furnace in the usual manner letting the burner preheat the combustion chamber and ignite the liquid to be processed and later manually or automatically convert some or all burners to supply a non-combustible waste liquid. With this arrangement, the combustible liquid fed through the upper center nozzles serves as means to provide processing heat for the non-combustible liquid flowing through the burners.

Depending on the liquid to be processed, a variety of auxiliary components can be attached to the furnace. As previously explained, for combustible liquids, the furnace is provided with a boiler or heat exchanger to convert the high temperature exit gases from the combustion chamber into useful energy. For hazardous liquids that require high temperatures and a long retention time before being combusted, the furnace is provided with a secondary chamber, which may be nothing more than a lengthened extension at the bottom of the normal combustion chamber, to lengthen the residence time of the gases at high temperature. For other liquids that contain uncombustible particles, or harmful exit gases the furnace is provided with dust collecting equipment. Any one or more of these auxiliary devices may be installed on each unit.

To optimize the use of the high exit temperture exiting from the furnace, the furnace may be provided with a variety of auxiliary systems such as a mechanism for the cleaning and sterilizing of 200 liter steel drums, mechanism to process sludges, distilling equipment, or other devices that require heat.

The physical size of the furnace and the number of spray nozzles will depend upon the furnace capacity. The furnace can be built in small sizes of less than one gallon per minute capacity to larger capacities, such as 2000 liters per hour or larger.

Since, during normal operation, the liquid spray is never in contact with the furnace insulation, ceramic fiber insulation may be advantageously employed in place of conventional refractory as insulation for the combustion chamber. Ceramic fiber insulation can be rapidly heated and cooled eliminating the customary

long preheating time required for refractory. No heat is required during shutdown periods. The ceramic fiber insulation weighs a fraction of what refractory weighs and costs less. Also, unlike a refractory lined furnace, the furnace of the present invention can be rapidly heated and cooled without damage to any part of the furnace. The use of ceramic fiber as insulation also makes the furnace very suitable for small and portable units where weight and frequent start-ups have to be considered. Ceramic fiber also saves on fuel costs since no preheating or maintaining of heat in the furnace is required.

For practical purposes, there are no temperature limitations on the furnace for fluid processing. However, normal operating temperatures for processing are generally in the range of 1,000°C - 1,300°C, but may be as high as 1,400°C with a maximum temperature of 1,600°C. The liquid furnace of the present invention with high operating temperatures and long process retention time, and where required the additional use of dust collecting equipment, guarantees an environmentally clean and safe operation which will meet the most stringent anti-pollution laws.

By the use of a boiler or heat exchanger as previously explained, the liquid furnace of the present invention converts combustible waste liquids into useful energy, and the furnace thus becomes a burner which utilizes combustible waste liquids as fuel. Even with non-combustible waste liquids, the energy given off by the exit gases may be utilized. With combustible waste liquids, the auxiliary burners in the furnace serve to preheat the combustion chamber, to maintain a set temperature and supply primary air.

The present invention enables those skilled in the art to build large capacity waste liquid burners which will provide heat for industrial and commercial facilities. The present invention also makes it possible for those skilled in the art to build small burners for industries that want to convert their waste liquids directly into a heat source or incinerate the waste.

The furnace of the present invention is designed not only to prevent explosions, by usual safety devices, but should one occur, it is designed such that the combustion chamber and auxiliary equipment will not be damaged. The top and sides of the furnace is provided with explosion relief means to relieve any explosions occuring in the combustion chamber. This is accomplished by providing explosion doors in the top and side walls of the furnace. The furnace top itself may be floating or merely resting on the remainder of the furnace, such that it will lift to engage a stop to permit explosion pressures to escape.

Other advantages of the present invention will become apparent from a perusal of the following detailed description of presently preferred embodiments taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of one embodiment of the liquid refuse processing furnace of the present invention.

Fig. 2 is a sectional view in side elevation taken of Figure 1.

Fig. 3 is a simplified system flow diagram illustrating the operation of the method and apparatus of the present invention.

Fig. 4 is a simplified burner control schematic piping diagram illustrating the fuel and air supplies to the burners of the furnace illustrated in Figs. 1, 2 and 3.

Fig. 5 is a partially diagrammatic plan view illustrating a variation of the liquid refuse furnace illustrated in Figs. 1 and 2 for larger liquid processing capacity.

Fig. 6 is a partially diagrammatic view in side elevation section of the furnace illustrated in Fig. 5 taken along line VI-VI.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The processing furnace illustrated in Figs. 1 and 2 generally comprises a metal cylindrical furnace jacket 11 having a floating top 12 and access doors that open during an explosion. To prevent damage due to explosions, the entire inside of the furnace jacket 11 is lined with adequate insulation 13 on the inner cylindrical side wall, insulation 14 on top circular wall 12 and insulation 15 covering the bottom of the furnace. Insulation 13, 14 and 15 defines a vertical cylindrical combustion chamber 16 within the furnace 10. The insulation 13, 14 and 15 is any suitable insulation such as refractory insulation, and preferably a ceramic fiber felt insulation such as sold under the trademark FIBERFAX. The insulation should be capable of withstanding temperatures of up to approximately 1,600°C.

Radiant burner means in the form of four flat flame radiant type burners 17 are provided on the side walls of combustion chamber 16 and disposes equi-angularly thereabout to provide a uniform heat distribution.

These flat flame radiant type burners 17 may be conventionally found on the market and are manufactured as, for example, by Hauck Manufacturing Company of Lebanon, Pennsylvania, or by North American Combustion Corporation. The characteristics of such burners are that they produce a flat flame and actually heat their own refractory tile and the refractory surface of the surrounding furnace wall by convection from the high velocity combustion gases thrown sideways from the burners. The hot gases from the burners have no final velocity in the direction towards the center of combustion chamber 16 in order to provide as much true radiant heating as possible, or to prevent flame impingement of the liquid being treated, as will be hereinafter explained.

Each of the burners 17 has a nozzle outlet formed of refractory tile 18 with a flared or conical outlet port 19 to produce the flat flame which hugs the inner wall of the combustion chamber 16.

Fuel is supplied to the burners through fuel supply pipe 20 which surrounds the entire furnace 10 and feeds all four burners from main fuel supply pipe 21. A main fuel shut-off valve 22 is provided for each burner 17. The fuel in many cases will consist of waste liquids which normally have to be incinerated.

Burner primary combustion air is supplied to each of the four burners 17 through pipe 23, which in turn is supplied from primary air supply pipe 24.

Other types of radiant burners, such as electric, etc., may be substituted, but the type disclosed is preferred for the controllability, efficiency, and for the additional fact that combustion air may be supplied through the burners 17 even though the burner

fuel supply has been shut off. Otherwise, separate combustion air supply facilities would have to be constructed.

For rigid support of the burners 17 and their supply pipes, a support structure 25 is provided. This support structure 25 as illustrated is formed from angle iron, but any suitable support material will suffice.

In addition, the support structure 25 also supports assembly 26 at the top which is the waste liquid, atomizing air and a primary combustion air input assembly. This assembly consists of waste liquid feed pipe 27, atomizing air feed pipe 19 and primary combustion air feed pipe 28. Atomizer tip or nozzle 29 is provided at the bottom of waste liquid feed pipe 27. The atomizing air being fed through pipe 19 from a compressor (not shown) is coaxially fed downward around pipe 27 and feeds into nozzle 29 to atomize the liquid spray which is sprayed downwardly from nozzle 29 as generally indicated by the dashed outline at 30. Atomizer nozzle 29 is a spray nozzle conventional in operation such as the type used for paint spray. The spray is atomized by the air supply in order to enhance combustion. Atomizing air fed from pipe 27 exits directly into the top of the combustion chamber.

Nozzle 29 sprays the atomized waste liquid downwardly into combustion chamber 16 in a controlled or predetermined pattern, such as indicated at 30, such that the spray does not impinge on the side walls of chamber 16 and does not impinge on the flames of radiant heaters 17.

An exhaust port 31 is provided adjacent the bottom of combustion chamber 16 for continually drawing off combustion gases. Exhaust port 31 is formed by exhaust duct 32 with its internal insulation 33. The exhaust gases are continually drawn off as with a fan, thereby providing a continuous negative pressure within combustion chamber 16.

A furnace door 34 is also provided at the bottom of combustion chamber 16 for access into the interior of the bottom of the chamber in order to periodically clean the furnace bottom where incombustible particles will accumulate. The door also serves as an explosion door. Should an explosion occur inside the combustion chamber, the door opens relieving the pressure without damaging the interior of the chamber. Top 12 is also floating, or merely resting on the furnace jacket 11, such that when an explosion occurs, the top will raise until it hits the top support structure to relieve explosion pressures upwardly.

Turning next to the system flow diagram of Fig. 3, those elements from Figs. 1 and 2 which are identical are given the same numeral designations. The waste liquid to be processed is stored in tank 40 and is preferably agitated by agitator 41 to keep the liquid thoroughly mixed.

An optional electric heater may be provided at the outlet of tank 40 to waste liquid feed line 27 in order to heat the liquid exiting the tank if required, in order to preheat for combustion or to make the liquid less viscous.

Filter 43 may also be provided optionally in feed line 27 in order to filter out large particles which

could possibly clog spray nozzle 29. In addition, the flow within waste liquid feed line 27 is controlled by valve 44.

The waste liquid is pumped through line 27 from tank 40 by means of the pump-motor combination 45. Pump 45 may be variable speed in order to regulate the fluid pressure exiting nozzle 29.

Quench air or additional air is drawn in through pipe 28 and the damper 47 by variable speed exhaust fan 48. Atomizing air is fed to nozzle 29 from an air compressor through pipe 19. Thus, by regulating the waste liquid flow, pressure and the atomizing air pressure in line 19 and the atomizer nozzle 29 characteristics, the pattern and characteristics of the liquid spray can be easily regulated.

The combustion gases within furnace 10 are continually drawn off to provide a negative pressure within the combustion chamber of the furnace through outlet duct 31 by means of fan 48. Exhaust duct 31 is provided with a bleed-in air damper as indicated. Also, a boiler or other type heat exchanger 49 is provided in exhaust duct 31 in order to take advantage of the exhaust heat, such as for heating other plant facilities or for preheating either one of the air intakes into the furnace 10 itself.

Piping for air and fuel for burner 17 is illustrated in more detail in the schematic of Fig. 4. In this Figure, the fuel for burner 17 flows from a fuel source via line 21 into a conventional fuel control and safety component device 50 and then on through line 21 to pipe line 20 to the four flat flame burners via their shut-off valves 22.

The combustion air for burners 17 is supplied via line 24 from combustion air blower 51 and flows through a main valve shut-off 52 to each of the four burners 17.

For combustible liquids, the burners 17 function to preheat combustion chamber 16. Once the atomized spray 30 has attained sustained combustion and normal operating temperatures are maintained, burners 17 are shut off. However, primary air is still fed through the burners via line 24 to maintain the supply of primary combustion air for the liquid to be processed and to also supply cooling air for the combustion chamber. The rate of this air flow can be regulated by blower 51 or valve 52 or a combination thereof. Burners 17 may also be operated automatically through the use of temperature controls in order to re-ignite the burners if for any reason the temperature should drop below a predetermined value within the combustion chamber and as preset on a conventional temperature control.

An example of some of the liquids which in fact have been processed in the present invention are paint solvents, reactor solvents (resin waste), waste oils from transformers, styrene waste, hexane waste, cyclohexane waste, water and oil mixtures (70% water, 30% oil in test examples), uncontaminated water, and assorted liquids from plastic manufacturing.

The capacity of the furnace varies with the liquid being processed. The average capacity for combustible liquids in a small pilot facility constructed similar to that illustrated in Figs. 1 and 2, is 100 liters per hour, and for non-combustible liquids, 200 to 400 liters per hour. In test runs, the combustion chamber size was only 1 meter in diameter and 2.36 meters high.

The combustion chamber temperature was 1200°C, and the exit temperature was 1260°C, with a slight negative combustion chamber pressure. Complete combustion was obtained without the requirement of added pollution controls, yet environmental standards were easily met.

For larger capacities, a larger furnace may be constructed in accordance with the teachings of the present invention as illustrated in the block diagrams of Figs. 5 and 6. In addition, additional levels of radiant burners and additional spray nozzles may be provided in the furnace. For example, when processing non-combustible liquids, it may take a longer free fall combustion zone within the furnace to obtain complete combustion of the liquid spray. The burners may thus be arranged to form an almost un-interrupted wall of flame from the top of the combustion chamber to a point below which no more processing is required. This can be accomplished by supplying more burners disposed about the furnace and additional layers or levels of burners within the combustion chamber. Under such conditions, it can also be seen that the burner flames or the air emanating therefrom help to serve as a separation media between the processed liquid and the combustion chamber insulation.

Turning particularly to Figs. 5 and 6, these Figures illustrate the furnace of the present invention in a much larger capacity so that much larger quantities of waste liquids may be processed, and in addition a longer retention time capability for processing in the larger furnace is enhanced.

In Figs. 5 and 6, like elements to those illustrated in Figs. 1 and 2 are designated with the same numerals, and like elements which are provided in multiple are provided with the same numerals primed.

In the embodiment of Figs. 5 and 6, four levels of radiant burners 17 are provided, and four burners are disposed about the furnace combustion chamber 16 for each level. This provides an almost un-interrupted wall of flame from the top of the combustion chamber 16 to a point below which no more processing is required. This is particularly effective for non-combustible liquids or liquids fed in large capacities to the furnace. In addition, the bottom of the combustion chamber 16 may be lengthened to provide additional retention time.

Instead of just one nozzle feeding the atomized liquid spray into the chamber, a multiplicity of nozzles are symmetrically arranged in the top of the furnace to enable one to feed different types of liquid simultaneously into the combustion chamber. With this arrangement, it is possible to feed non-combustible liquid through the center nozzle and one or more combustible liquids with different characteristics through other nozzles while feeding still another liquid that does not mix with the aforesaid liquids through yet another feed nozzle. This feed system optimizes the furnace's efficiency and improves the scope or capabilities of the unit.

Regarding operation of the furnace illustrated in Figs. 5 and 6, it is entirely the same as that described in conjunction with Figs. 1 through 4.

In addition, if at least some of the nozzles 29' are feeding combustible liquids as self combustion has been sustained, the fuel supply to some or all of the burners 17' may be shut off and a non-combustible or partially combustible liquid may then be fed through selected burners, via their fuel supply lines, along with combustion air for processing by the heat given off by the burning combustible liquid waste.

The skilled artisan will change the variables of the furnace such as waste liquid pressure, atomizing pressure, burner fuel, burner combustion air pressure and exhaust draw within his ordinary skill, depending upon the liquid being processed of the many different types of liquid or fluid possible. Accordingly, while presently preferred embodiments of the invention have been shown and described in particularity, the invention may be otherwise embodied within the scope of the appended claims.

What is claimed is:

1. A processing furnace for fluid refuse comprising a vertical insulated combustion chamber having a top and a bottom, radiant burner means on the sides of said chamber capable of heating said chamber with radiant heat to a temperature sufficiently high to combust fluid refuse to be sprayed therein, at least one waste fluid spray nozzle means in the top of said chamber to spray said fluid downwardly in said chamber in a predetermined spray pattern so that said spray does not contact the side walls of said chamber and does not impinge said radiant burner means, combustion air supply means for providing combustion air to said chamber, and exhaust port means adjacent the bottom of said chamber for the drawing off of combustion gases.

2. The processing furnace of claim 1 wherein the fluid refuse to be processed is a liquid and including atomizing air supply means in the top of said chamber for atomizing said fluid spray.

3. The processing furnace of claim 1 including fan means to continually draw a negative pressure in said chamber through said exhaust port.

4. The processing furnace of claim 3 including a heat exchanger in said exhaust port.

5. The processing furnace of claim 1 wherein the insulation for said chamber is a ceramic fiber felt insulation.

6. The processing furnace of claim 1 wherein said combustion chamber is cylindrical.

7. The processing furnace of claim 1 wherein said radiant heater means is a plurality of flat flame radiant type burners disposed about the inner side walls of said combustion chamber and said nozzle means is designed to provide said spray pattern which does not impinge on the flame of said burners.

8. The processing furnace of claim 7 wherein said burners are adapted to provide a separation barrier of flame or air between said inner side walls and said spray pattern.

9. A method of processing fluid refuse comprising the steps of, heating a vertical insulated combustion chamber from the inner side walls thereof with radiant burner means, feeding combustion air into said chamber, spraying fluid refuse downwardly from the top of the combustion chamber in a controlled pattern within said combustion chamber without contacting said inner side walls and said radiant burner means while the temperature within said chamber is sufficiently high to combust said fluid refuse while falling, and continually drawing off gases of combustion from said chamber adjacent the bottom thereof.

10. The method of processing fluid refuse as claimed in claim 9, wherein the step of heating from the inner side walls is carried out by a plurality of flat flame radiant type burners disposed about the inner side walls and the pattern of said spray is controlled not to impinge on the flames of said burners.

11. The method of processing fluid refuse as claimed in claim 10, wherein the step of feeding combustion air into said chamber is carried out through said side wall burners.

12. The method of processing fluid refuse as claimed in claim 9, wherein the fluid to be combusted is liquid and including the step of atomizing said fluid refuse spray.

13. The method of processing fluid refuse as claimed in claim 10, wherein the fluid refuse being combusted is combustible and including the step of shutting off the fuel supply to said radiant burner means while continuing to feed combustion air into said chamber through said side wall burners after the combustible fluid refuse spray has attained sustained combustion.

14. The method of processing fluid refuse as claimed in claim 9 wherein the step of spraying includes the step of independently spraying a plurality of different waste fluids through a plurality of different nozzles in the top of said chamber.

FIG. 1

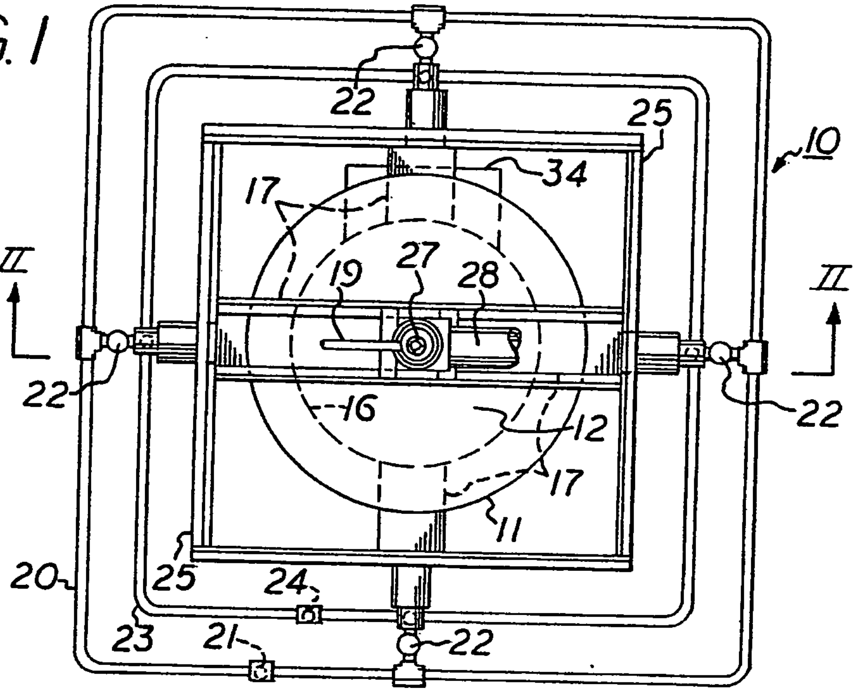
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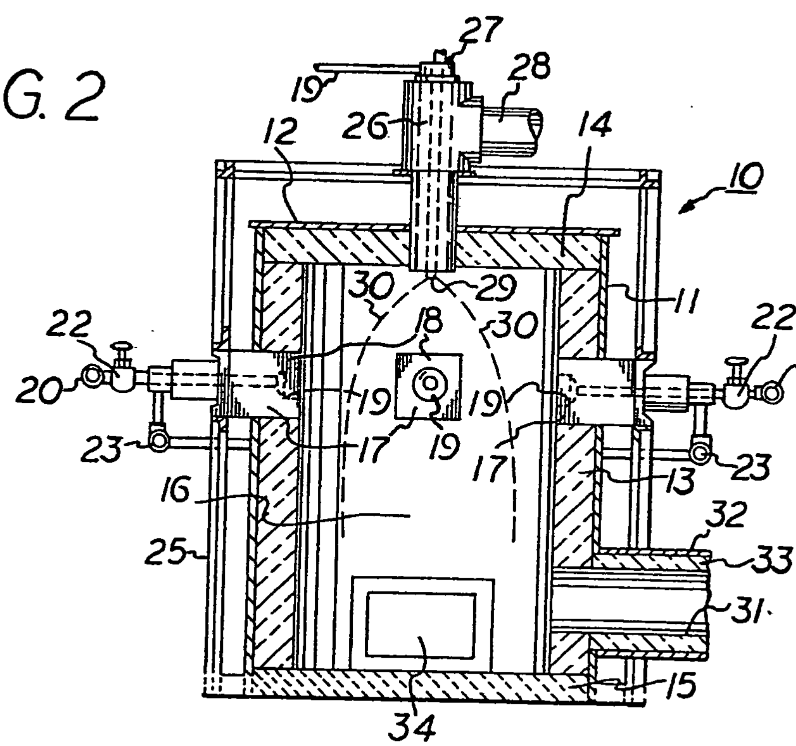
FIG. 2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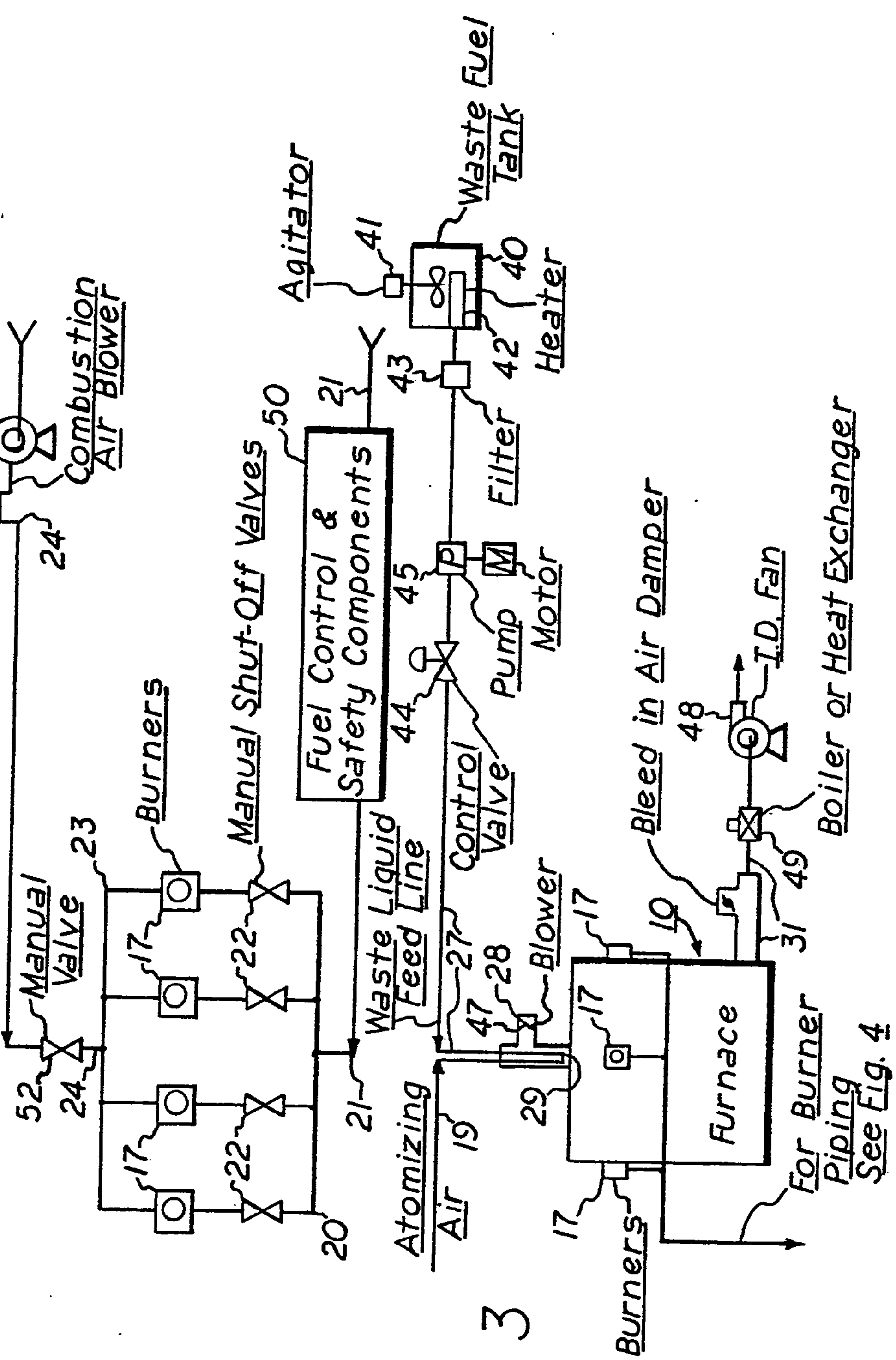
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Atomizing Air
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28
Blower
29
Agitator
41
Waste Fuel Tank
40
42
Heater
43
Filter
45
P
M
Pump
Motor
44
Control Valve
Bleed in Air Damper
48
I.D. Fan
Boiler or Heat Exchanger
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Furnace
For Burner Piping See Fig. 4
Burners

FIG. 4

FIG. 3

FIG 5

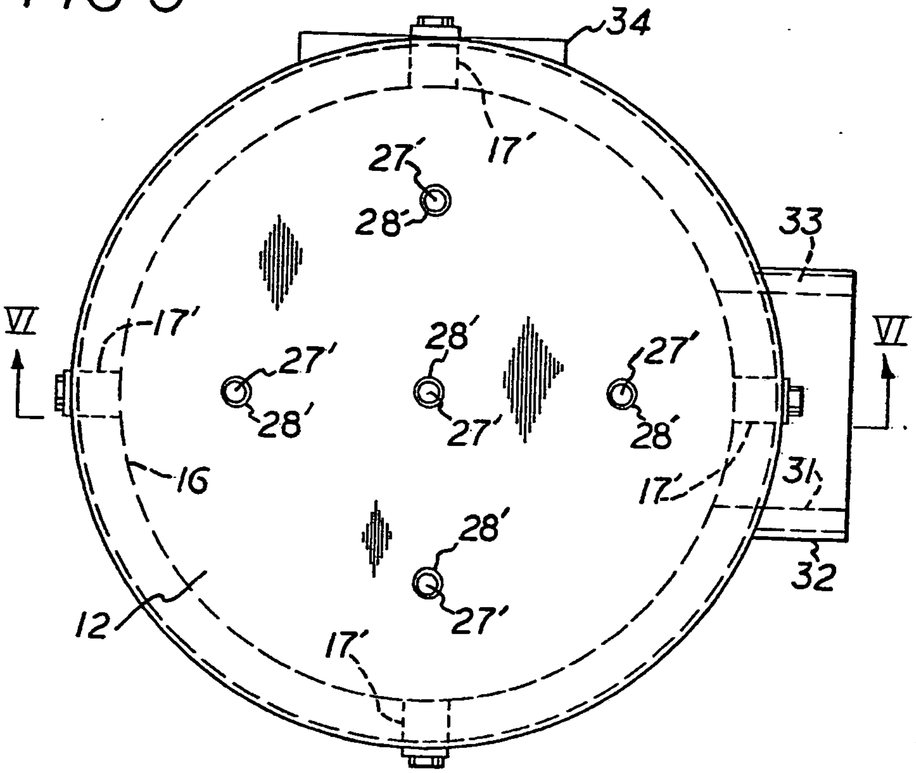
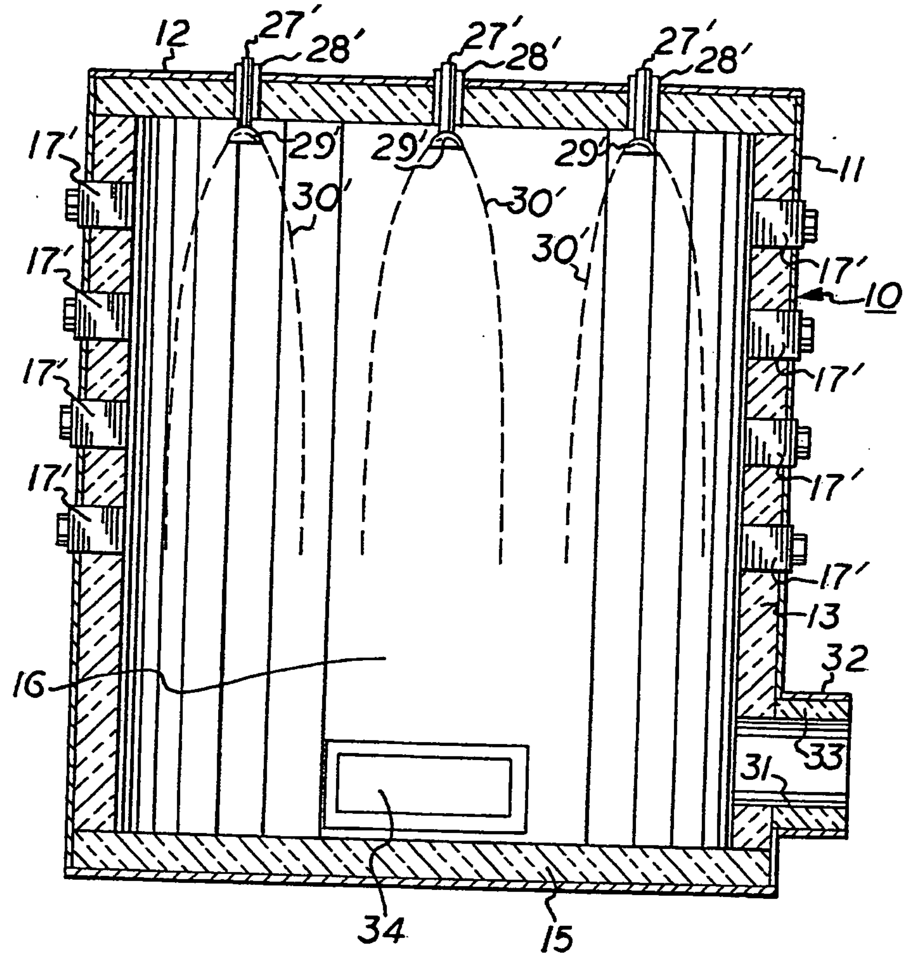


FIG 6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INTERNATIONAL SEARCH REPORT

International Application No PCT/US/79/00791

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

INTL. CL. F23G 7/04
U.S. CL. 110/238

WO 80/00741

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	110/235, 238, 346, 253 431/2, 8, 159

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
A	US,A, 3,738,289 Published 12 June 1973 Hanway, Jr.	
A	US,A, 3,954,381 Published 4 May 1976 Marecaux	
A	US,A, 3,822,653 Published 9 July 1974 Ghelfi	
A	US,A, 2,535,730 Published 26 December 1950 Gadret	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
14 January 1980	23 JAN 1980
International Searching Authority [1]	**Signature of Authorized Officer [20]**
ISA/US	Edward G. Favors EDWARD G. FAVORS

Form PCT/ISA/210 (second sheet) (October 1977)

DERWENT-ACC-NO: 1980-D8846C

DERWENT-WEEK: 198017

TITLE: Waste pumpable liq. **burner** - has spray nozzle and coaxial air supply at top of cylindrical chamber contg. flat flame **burners** in sides

INVENTOR: KONRAD, K

PATENT-ASSIGNEE: KONRAD K[KONRI] , NOCE A J[NOCEI]

PRIORITY-DATA: 1978US-0948393 (October 4, 1978)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 8000741 A	April 17, 1980	E	000	N/A
EP 20504 A	January 7, 1981	E	000	N/A
JP 55500829 A	October 23, 1980	N/A	000	N/A
US 4206711 A	June 10, 1980	N/A	000	N/A

DESIGNATED-STATES: BR JP AT CH DE FR GB NL SE AT CH DE FR GB NL SE

CITED-DOCUMENTS: US 2535730; US 3738289 ; US 3822653 ; US 3954381

INT-CL (IPC): F23G007/04, F23M005/00 , F23M011/00

ABSTRACTED-PUB-NO: WO 8000741A

BASIC-ABSTRACT:

The processing furnace has radiant **burners** on the sides of a vertical insulated combustion chamber, the latter having a waste fluid inlet spray at the top. The spray pattern does not contact the sides of the chamber and does not impinge the **burners**. Exhaust ports are provided adjacent the bottom of the combustion chamber.

A fan can be included to draw the exhaust gases through the exhaust port, the latter including a heat exchanger. The combustion chamber **insulation pref. consists of a ceramic fibre felt insulation.**

TITLE-TERMS: WASTE PUMP LIQUID **BURNER** SPRAY NOZZLE COAXIAL AIR SUPPLY TOP CYLINDER CHAMBER CONTAIN FLAT FLAME **BURNER** SIDE

DERWENT-CLASS: Q73

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